AGU FALL MEETING
San Francisco | 12–16 December 2016

S43E-03: Modelling of Earthquake Ground Response in the Maltese Islands Using Results from Geophysical Investigations

Thursday, 15 December 2016
13:55 - 14:10
Moscone South - 307

The Maltese archipelago is characterised by a four layer sequence of limestones and clays. The Lower Coralline Limestone is the oldest exposed layer, overlain by the Globigerina Limestone. Some parts of the islands are characterised by Upper Coralline Limestone plateaus and hillcaps covering a soft Blue Clay layer which can be up to 75 m thick. The BC layer introduces a velocity inversion in the stratigraphy, and makes the Vs30 parameter not always suitable for seismic microzonation purposes. Such a layer may still produce amplification effects, however would not contribute to the numerical mean of Vs in the upper 30m. In this study, site response analysis for the Maltese islands is conducted, with particular attention being given to sites described above.

Array and single-station measurements of ambient noise were first carried out at numerous sites in Malta. Surface wave dispersion and H/V curves were jointly inverted using a genetic algorithm, so that the Vs profiles were obtained.

The stochastic extended-fault algorithm EXSIM was used to simulate historical and recent earthquakes at the bedrock. These were used in conjunction with the equivalent-linear programme SHAKE2000 to carry out the site-specific response analysis, using the derived geophysical models. Maps of ground motion parameters, such as peak ground acceleration and spectral accelerations, confirm that the clay, even when buried under a hard outcropping layer can still produce significant amplifications at frequencies which are of engineering interest when considering the recent urbanisation patterns. The results of this project will give important, and previously unavailable information and predictions about the behaviour of local lithotypes in response to earthquake ground shaking while also contributing knowledge about the issue of buried low velocity layers.

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